

IN THE CLAIMS:

Please cancel Claims 85-89 without prejudice to or disclaimer of the subject matter contained therein.

1. (Previously Presented) An ink-jet recording apparatus for forming an image on a recording medium comprising a plurality of ink discharge means and a plurality of ink discharge openings and containing a plurality of inks, wherein the plurality of inks is discharged from the plurality of ink discharge openings by driving the ink discharge means, each ink having a penetrability, a dye density and a color;

said plural ink discharge openings corresponding to a plurality of inks with different dye densities, wherein the penetrabilities of inks having different dye densities and same colors are different from each other and ink having low dye density among the plurality of inks of different dye densities and same colors has more penetrability with respect to the recording medium than ink having high dye density;

and wherein said plurality of inks contain different component ratios of a surfactant, wherein an ink having a relatively high dye density has a lower component ratio of said surfactant than an ink having a relatively low dye density,

said apparatus further comprising control means for performing gradational recording by controlling discharge of each of the plurality of inks with different dye densities based on inputted image data, the image data being data representing a density level,

wherein said control means controls recording so that recording is performed by mainly using ink having low dye density when the density level represented by the image data is relatively low and recording is performed by mainly using ink having high dye density when the density level represented by the image data is relatively high.

2-3. (Cancelled)

4. (Previously Presented) The ink-jet recording apparatus according to claim 1, wherein said plural inks consist of the first ink with a relatively high dye density in ink and the second ink with a relatively low dye density in ink in comparison with the first ink, said first ink containing no surfactant in a composition thereof, while said second ink contains said surfactant in a composition thereof.

5. (Original) The ink-jet recording apparatus according to claim 1, comprising an image processing means which controls the number of recording dots per unit area of said recording medium in accordance with an inputted image signal to perform gradation recording.

6. (Original) The ink-jet recording apparatus according to claim 5, further comprising a distribution means for distributing into recording data for said plural inks with different dye densities in inks in accordance with a gradation indicated by an inputted image signal.

7. (Original) The ink-jet recording apparatus according to claim 1, wherein said ink discharge means is means, which discharges an ink by utilizing heat energy and which is provided with an electrothermal energy converting means for generating heat energy to be given to an ink.

8. (Original) The ink-jet recording apparatus according to claim 7, wherein said ink discharge means causes an ink to develop a state change by the heat energy applied by said electrothermal energy converting means, thereby discharging the ink through a discharge port according to said state change.

9. (Original) The ink-jet recording apparatus according to claim 1, further comprising an image reading means for reading an original image.

10. (Original) The ink-jet recording apparatus according to claim 1, further comprising an image transmitting and/or receiving means.

11. (Original) The ink-jet recording apparatus according to claim 10, further comprising an image reading means for reading an original image.

12. (Original) The ink-jet recording apparatus according to claim 1, further comprising an input means for entering a recording signal.

13. (Original) The ink-jet recording apparatus according to claim 12, wherein said input means is a keyboard.

14. (Previously Presented) An ink-jet recording method for forming an image on a recording medium comprising the steps of:

providing a plurality of inks, each having a penetrability, a dye density and a color;

providing a recording medium;

providing a plurality of ink discharge openings and a plurality of ink discharge means;

discharging onto the recording medium the plurality of inks from the plurality of ink discharge openings by driving the ink discharge means;

said plurality of ink discharge openings corresponding to a plurality of inks with different dye densities, wherein the penetrabilities of inks having different dye densities and same colors are different from each other, and ink having low dye density among the plurality of inks of different dye densities and same colors has more penetrability with respect to the recording medium than ink having high dye density;

wherein said plurality of inks contain different component ratios of a surfactant, wherein an ink having a relatively high dye density has a lower component ratio of said surfactant than an ink having a relatively low dye density;

performing gradational recording by controlling discharge of each of the plurality of inks with different dye densities based on inputted image data, the image data being data representing a density level,

wherein discharge is controlled so that recording is performed by mainly using ink having low dye density when the density level represented by the image data is relatively low and recording is performed by mainly using ink having high dye density when the density level represented by the image data is relatively high.

15-16. (Cancelled)

17. (Previously Presented) The ink-jet recording method according to claim 14, wherein said plural inks consist of the first ink with a relatively high dye density in ink and the second ink with a relatively low dye density in ink in comparison with the first ink, said first ink containing no surfactant in a composition thereof, while said second ink contains said surfactant in a composition thereof.

18. (Original) The ink-jet recording method according to claim 14, comprising an image processing step wherein the number of recording dots per unit area of said recording medium is controlled in accordance with an inputted image signal to perform gradation recording.

19. (Original) The ink-jet recording method according to claim 18, further comprising a distribution step distributing into recording data for said plural inks with different dye densities in inks in accordance with a gradation indicated by an inputted image signal.

20. (Original) The ink-jet recording method according to claim 14, wherein said ink discharge means is a means, which discharges an ink by utilizing heat energy and which causes the ink to develop a state change by heat energy and to be discharged through a discharge port according to said state change.

21. (Previously Presented) An ink-jet recording apparatus, comprising a recording head equipped with a plurality of ink discharge means, and a plurality of discharge ports and containing a plurality of inks, wherein the plural discharge ports of said recording head are comprised of a plurality of discharge port trains corresponding to the plurality of inks, wherein the plurality of inks is discharged onto a recording medium to form an image, each of the plurality of inks having a penetrability, a color and a different dye density, wherein the penetrabilities of inks having different dye densities and same colors are different from each other and ink having low dye density among the plurality of inks of different dye densities and same colors has more penetrability with respect to the recording medium than ink having high dye density;

and wherein said plurality of inks contain different component ratios of a surfactant, wherein an ink having a relatively high dye density has a lower component ratio of said surfactant than an ink having a relatively low dye density,

said apparatus further comprising control means for performing gradational recording by controlling discharge of each of the plurality of inks with different dye densities based on inputted image data, the image data being data representing a density level,

wherein said control means controls recording so that recording is performed by mainly using ink having low dye density when the density level represented by the image data is relatively low and recording is performed by mainly using ink having high dye density when the density level represented by the image data is relatively high.

22. (Original) The ink-jet recording apparatus according to claim 21, comprising a plurality of said recording heads, each of said plural recording heads discharging ink of a different color.

23-24. (Cancelled)

25. (Previously Presented) The ink-jet recording apparatus according to claim 21, wherein said plural inks with different dye densities in ink consist of the first ink with a relatively high dye density in ink and the second ink with a relatively low dye density in ink in

comparison with the first ink, said first ink containing no surfactant in a composition thereof, while said second ink contains said surfactant in a composition thereof.

26. (Original) The ink-jet recording apparatus according to claim 21, comprising an image processing means which controls the number of recording dots per unit area of said recording medium in accordance with an inputted image signal to perform gradation recording.

27. (Previously Presented) The ink-jet recording apparatus according to claim 26, further comprising a distribution means which divides entered data as recording data for said plural inks with different dye densities in inks in accordance with a gradation indicated by an inputted image signal.

28. (Original) The ink-jet recording apparatus according to claim 21, wherein said ink discharge means is a means, which discharges an ink by utilizing heat energy and which is provided with an electrothermal energy converting means for generating heat energy to be given to an ink.

29. (Original) The ink-jet recording apparatus according to claim 28, wherein said ink discharge means causes an ink to develop a state change by the heat energy applied by

said electrothermal energy converting means, thereby discharging the ink through a discharge port according to said state change.

30. (Previously Presented) An ink-jet recording apparatus, comprising a plurality of recording heads equipped with a plurality of ink discharge means and a plurality of discharge ports and containing a plurality of inks, wherein said plural recording heads correspond to the plurality of inks, each ink having a penetrability, a color and a different dye density, wherein the plurality of inks is discharged onto a recording medium to form an image, and wherein the penetrabilities of inks having different dye densities and same colors are different from each other and ink having low dye density among the plurality of inks of different dye densities and same colors has more penetrability with respect to the recording medium than ink having high dye density;

and wherein said plurality of inks contain different component ratios of a surfactant, wherein an ink having a relatively high dye density has a lower component ratio of said surfactant than an ink having a relatively low dye density,

said apparatus further comprising control means for performing gradational recording by controlling discharge of each of the plurality of inks with different dye densities based on inputted image data, the image data being data representing a density level,

wherein said control means controls recording so that recording is performed by mainly using ink having low dye density when the density level represented by the image data

is relatively low and recording is performed by mainly using ink having high dye density when the density level represented by the image data is relatively high.

31-32. (Cancelled)

33. (Previously Presented) The ink-jet recording apparatus according to claim 30, wherein said plural inks with different dye densities in ink consist of the first ink with a relatively high dye density in ink and the second ink with a relatively low dye density in ink in comparison with the first ink, said first ink containing no surfactant in a composition thereof, while said second ink contains said surfactant in a composition thereof.

34. (Original) The ink-jet recording apparatus according to claim 30, wherein said ink discharge means is a means, which discharges an ink by utilizing heat energy and which is provided with an electrothermal energy converting means for generating heat energy to be given to an ink.

35. (Original) The ink-jet recording apparatus according to claim 34, wherein said ink discharge means causes an ink to develop a state change by the heat energy applied by said electrothermal energy converting means, thereby discharging the ink through a discharge port according to said state change.

36. (Cancelled)

37. (Previously Presented) An ink-jet recording apparatus which forms an image on a recording medium by using a plurality of ink discharge means discharging a plurality of inks, wherein said plural ink discharge means correspond to the plurality of inks, the plurality of inks are inks having different dye densities with respect to a plurality of colors, the plurality of inks are contained in a plurality of ink containers and each of the plurality of ink containers corresponds to a different color of ink, each of the ink containers containing a plurality of inks having different dye densities of a same color series; and

wherein said plural inks having different dye densities in ink have different penetrabilities on a recording medium.

38. (Cancelled)

39. (Previously Presented) The ink-jet recording apparatus according to claim 37, wherein said plural inks having different dye densities in ink are held in said ink containers, the volume of each of said inks being different.

40. (Cancelled.)

41. (Previously Presented) The ink-jet recording apparatus according to claim 37, wherein said plural inks with different dye densities in ink have different component ratios of surfactant in ink.

42. (Previously Presented) The ink-jet recording apparatus according to claim 41, wherein, among said plural inks, an ink having a relatively high dye density in ink has a lower component ratio of said surfactant than an ink having a relatively low dye density.

43. (Previously Presented) The ink-jet recording apparatus according to claim 41, wherein said plural inks with different dye densities in ink consists of the first ink with a relatively high dye density in ink and the second ink with a relatively low dye density in ink in comparison with the first ink, said first ink containing no surfactant in a composition thereof, while said second ink containing said surfactant in a composition thereof.

44. (Original) The ink-jet recording apparatus according to claim 41, comprising an image processing means which controls the number of recording dots per unit area of said recording medium in accordance with an inputted image signal to perform gradation recording.

45. (Original) The ink-jet recording apparatus according to claim 44, further comprising a distribution means which divides entered data as recording data for said plural inks.

with different dye densities in inks in accordance with a gradation indicated by an inputted image signal.

46. (Original) The ink-jet recording apparatus according to claim 41, wherein said ink discharge means is a means, which discharges an ink by utilizing heat energy and which is provided with an electrothermal energy converting means for generating heat energy to be given to an ink.

47. (Original) The ink-jet recording apparatus according to claim 46, wherein said ink discharge means causes an ink to develop a state change by the heat energy applied by said electrothermal energy converting means, thereby discharging the ink through a discharge port according to said state change.

48. (Original) The ink-jet recording apparatus according to claim 41, further comprising an image reading means for reading an original image.

49. (Original) The ink-jet recording apparatus according to claim 41, further comprising an image transmitting and/or receiving means.

50. (Original) The ink-jet recording apparatus according to claim 49, further comprising an image reading means for reading an original image.

51. (Original) The ink-jet recording apparatus according to claim 41, further comprising an input means for entering a recording signal.

52. (Original) The ink-jet recording apparatus according to claim 51, wherein said input means is a keyboard.

53. (Previously Presented) An ink-jet recording apparatus, containing a plurality of inks and comprising a plurality of recording heads equipped with a plurality of ink discharge means, which discharge ink through discharge ports, and forming an image on a recording medium by discharging the ink through a plurality of discharge ports of said recording heads, wherein said plural recording heads correspond to the plurality of inks, the plurality of inks are inks having different dye densities with respect to a plurality of colors, the plurality of inks are contained in a plurality of ink containers and each of the plurality of ink containers corresponds to a different color of ink, each of the ink containers containing a plurality of inks having different dye densities of a same color series; and

wherein said plural inks having different dye densities in ink have different penetrabilities on a recording medium.

54. (Cancelled)

55. (Previously Presented) The ink-jet recording apparatus according to claim 53, wherein said plural inks having different dye densities in ink are held in said ink containers, the volume of each of said inks being different.

56. (Original) The ink-jet recording apparatus according to claim 53, wherein the plural discharge ports of said recording heads comprise a plurality of discharge port trains corresponding to a plurality of different color materials, and each of said plural recording heads is capable of discharging a plurality of the same color material.

57. (Original) The ink-jet recording apparatus according to claim 53, comprising an image processing means which controls the number of recording dots per unit area of said recording medium in accordance with an inputted image signal to perform gradation recording.

58. (Previously Presented) The ink-jet recording apparatus according to claim 57, further comprising a distribution means which divides entered data as recording data for said plural inks with different dye densities in inks in accordance with a gradation indicated by an inputted image signal.

59. (Original) The ink-jet recording apparatus according to claim 53, wherein said ink discharge means is a means, which discharges an ink by utilizing heat energy and which

is provided with an electrothermal energy converting means for generating heat energy to be given to an ink.

60. (Original) The ink-jet recording apparatus according to claim 59, wherein said ink discharge means causes an ink to develop a state change by the heat energy applied by said electrothermal energy converting means, thereby discharging the ink through a discharge port according to said state change.

61. (Previously Presented) An ink-jet recording apparatus containing a plurality of inks and comprising a plurality of recording heads equipped with a plurality of ink discharge means for discharging inks and forming an image on a recording medium by discharging the inks from a plurality of discharge ports of said recording heads, wherein said plural recording heads correspond to the plurality of inks having different color materials, the plural discharge ports of said recording heads comprising a plurality of discharge port trains corresponding to the plural inks having different dye densities, the plurality of inks are inks having different dye densities with respect to a plurality of colors, the plurality of inks are contained in a plurality of ink containers and each of the plurality of ink containers corresponds to a different color of ink, each of the ink containers containing a plurality of inks having different dye densities of a same color series; and

wherein said plural inks having different dye densities in ink have different penetrabilities on a recording medium.

62. Cancelled.

63. (Previously Presented) An ink-jet recording apparatus for recording by discharging a plurality of inks having different densities of a same color series for use with an ink-jet head for discharging ink, comprising:

a recording control means for recording by discharging a plurality of inks having different densities of a same color series by said ink-jet head, wherein the recording control means controls discharge of each of said plurality of inks in accordance with a level represented by input image data,

wherein each of said plurality of inks having different densities of the same series of color contains a different amount of surfactant for enhancing penetrability with respect to a recording medium, such that an ink having a low density contains a greater amount of said surfactant than an ink having a high density, and

wherein said recording control means controls recording with a plurality of inks having different densities so that recording is performed by mainly using ink having low density when the image data is a low level and recording is performed by mainly using ink having high density when the image data is a high level.

64. (Previously Presented) An ink-jet recording apparatus according to claim 63, wherein said plurality of inks consists of a first ink with a relatively high dye density and a

second ink with a relatively low dye density in comparison with the first ink, wherein said first ink contains no surfactant and said second ink contains said surfactant.

65. (Previously Presented) An ink-jet recording apparatus according to claim 63, comprising an image processing means that controls the number of recording dots per unit area of said recording medium in accordance with an inputted image signal to perform gradation recording.

66. (Previously Presented) An ink-jet recording apparatus according to claim 65, further comprising a distribution means for distributing into recording data for said plurality of inks with different dye densities in accordance with a gradation indication by an inputted image signal.

67. (Previously Presented) An ink-jet recording apparatus according to claim 63, wherein said ink is discharged by an ink discharge means that discharges an ink by utilizing heat energy and which is provided with an electrothermal energy converting means for generating heat energy to be given to an ink.

68. (Previously Presented) An ink-jet recording apparatus according to claim 67, wherein said ink discharge means causes an ink to develop a state change by the heat energy

applied by said electrothermal energy converting means, thereby discharging the ink through a discharge port according to said state change.

69. (Previously Presented) An ink-jet recording apparatus according to claim 63, further comprising an image reading means for reading an original image.

70. (Previously Presented) An ink-jet recording apparatus according to claim 63, further comprising an image transmitting and/or receiving means.

71. (Previously Presented) An ink-jet recording apparatus according to claim 70, further comprising an image reading means for reading an original image.

72. (Previously Presented) An ink-jet recording apparatus according to claim 63, further comprising an input means for entering a recording signal.

73. (Previously Presented) An ink-jet recording apparatus according to claim 72, wherein said input means is a keyboard.

74. (Previously Presented) An ink-jet recording method for recording by discharging a plurality of inks having different densities of a same color series for use with an ink-jet head for discharging ink, comprising the steps of:

inputting image data representing a density level;  
generating data for discharging ink, corresponding to each of a plurality of inks having different densities of a same color series in accordance with said image data; and  
recording by discharging ink based on said generated data,  
wherein each of said plurality of inks having different densities of the same color series contains a different amount of surfactant for enhancing penetrability with respect to a recording medium, such that an ink having a low density contains a greater amount of said surfactant than an ink having a high density, and  
wherein recording is performed with a plurality of inks and by mainly using ink having low density when the image data is a low level and mainly using ink having high density when the image data is a high level.

75. (Previously Presented) An ink-jet recording method according to claim 74, wherein said plurality of inks consists of a first ink with a relatively high dye density and a second ink with a relatively low dye density in comparison with the first ink, wherein said first ink contains no surfactant and said second ink contains said surfactant.

76. (Previously Presented) An ink-jet recording method according to claim 74, comprising an image processing step that controls the number of recording dots per unit area of said recording medium in accordance with an inputted image signal to perform gradation recording.

77. (Previously Presented) An ink-jet recording method according to claim 76, further comprising a distribution step for distributing into recording data for said plurality of inks with different dye densities in accordance with a gradation indication by an inputted image signal.

78. (Previously Presented) An ink-jet recording method according to claim 74, wherein said ink is discharged by an ink discharge step that discharges an ink by utilizing heat energy and includes an electrothermal energy converting sub-step for generating heat energy to be given to an ink.

79. (Previously Presented) An ink-jet recording method according to claim 78, wherein said ink discharge step causes an ink to develop a state change by the heat energy applied by said electrothermal energy converting sub-step, thereby discharging the ink through a discharge port according to said state change.

80. (Previously Presented) An ink-jet recording method according to claim 74, further comprising an image reading step for reading an original image.

81. (Previously Presented) An ink-jet recording method according to claim 74, further comprising an image transmitting and/or receiving step.

82. (Previously Presented) An ink-jet recording method according to claim 81, further comprising an image reading step for reading an original image.

83. (Previously Presented) An ink-jet recording method according to claim 74, further comprising an input step for entering a recording signal.

84. (Previously Presented) An ink-jet recording method according to claim 83, wherein said input step utilizes a keyboard.

85-89. (Cancelled)